MASSACHUSETTS CLEAN ENERGY CENTER

Ground-Source Heat Pump Funding & Resources

MassDEP / LSPA Meeting:

Geothermal / GSHP Application Opportunities Under the MCP

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MassCEC mission

- **Accelerate** clean energy technologies, companies and projects
- **Create** high-quality jobs and long-term economic growth
- **Support** municipal clean energy projects
- **Invest** in residential and commercial renewable energy installations
- **Cultivate** a robust marketplace for innovation

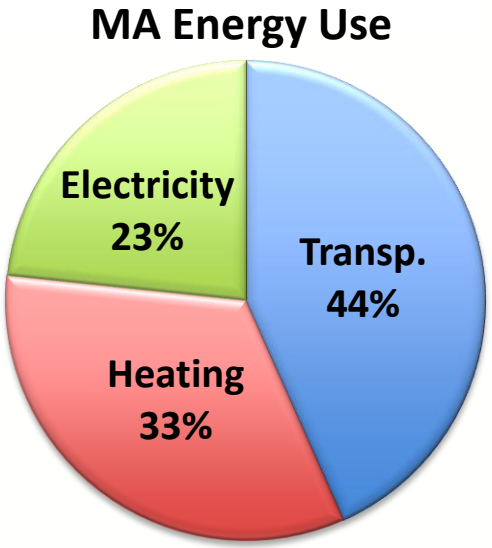
Renewable Energy Generation

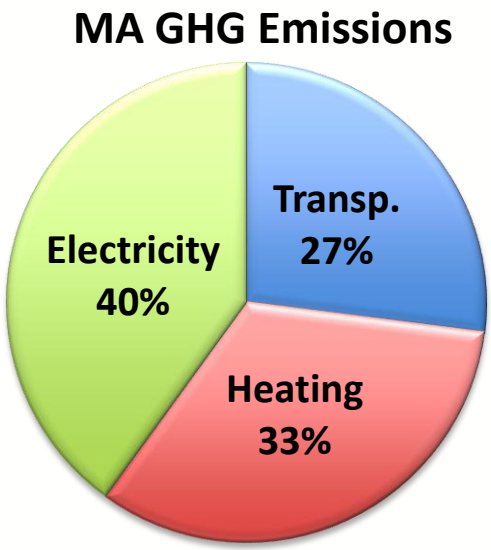
- Technologies we support:
  - **Electric:** Solar PV, Wind, Small Hydro, Anaerobic Digestion
  - **Thermal:** GSHPs, ASHPs, Biomass, District Energy, Solar Hot Water
- Support of the deployment of clean energy through:
  - Grants, rebates, and loans for installation/construction
  - Grants for early-stage project feasibility assessment
  - Technical guidance, research, market assessment
  - Marketing, outreach, training

Thermal Energy in MA

- National focus:
  - Renewables for electricity
  - Electric vehicles, biofuels
  - Limited focus on renewable heating

- Thermal energy accounts for:
  - 1/3 of MA energy use
  - 1/3 of energy-related GHG emissions





MA Heating Costs

- Average household heating cost: $1,700/yr
- 50% of homes heat use expensive fuels
  - 10% use electricity
  - 31% use fuel oil
  - 80+ towns have no access to natural gas

GSHPs reduce heating costs by about 50% vs. oil, propane, or electric resistance heat.

GSHP Opportunities & Barriers

- GSHPs provide major long-term cost and GHG savings vs. electricity and fuel oil
- Several barriers to industry growth

Barriers	Solution
High installation costs	Incentives
Limited awareness	Targeted outreach & marketing
Design & installation quality	1) Design review and project inspections 2) Installer training

MassCEC Clean Heating & Cooling Program

- Residential program that includes GSHPs, Biomass, and ASHPs
  - MassCEC has funded solar hot water through other programs since 2011
- Program timeframe
  - Pilot ran May - Oct. 2014
  - Current program launched Nov. 2014
- Residential GSHP awards to date:
  - 74 projects (35 installed; 39 more approved)
  - Awarded nearly $600,000 in grants

Commercial Pilot Program:
Renewable Thermal & District Energy Program

- **Solicitation Timeline**: Sept. 2013 - Sept. 2014
  - Funding reserved for ongoing projects
- **Grantees**: public entities, non-profits
- **Technologies**: GSHP, wood pellet boilers, district energy

Commercial-Scale Pilot Grant Structure

1. Feasibility study ($5,000)
   - Review study with CEC and technical consultants
   - Decide whether to proceed with project
2. Design & engineering ($20,000)
3. Construction ($4,000/heating ton; max. $108,000)

Lessons Learned

Program	Notable Lessons Learned
Residential Pilot	• Well-established, trained, and experienced set of installers • Equipment supply-chain is strong • Upfront installation costs are high • Existing but limited customer demand • Project design can be complex • COPs not as high as anticipated • Installation practices varied (esp. system sizing)
Commercial-Scale Pilot	• Limited availability of contractors • COPs not as high as anticipated • System sizing practices varied

Potential Commercial Program

- By July 1, we should know how much funding will be available for commercial GSHP.
  - Program launch would occur later.

- Key design considerations, if program launched
  - What to fund (feasibility studies, design/engineering, etc.)
  - Approval & contracting process
  - Outreach strategy
  - Program duration

GSHP Funding Summary

Sector	Incentive	Amount	Expires
Res	MassCEC Clean Heating and Cooling Grant	Max. $12,500	TBD
Res	Mass Save HEAT Loan	0% for 7 years; max. $25,000	TBD
Res	Federal Renewable Energy Tax Credit	30%	2016
Res	Sales Tax Exemption	100%	-
C&I	Investment Tax Credit	10%	2016

MassCEC does not currently offer GSHP funding for commercial entities. FY2016 begins July 1, and funding could be available later this year.

Resources & Training

- Installer training & certification organizations
  - New England Geothermal Professional Association (NEGPA)
  - International Ground-Source Heat Pump Association (IGSHPA)
- NEGPA/IGSHPA services
  - Directories of certified installers
  - Training for installers, project planners, customers
  - Technical guidance & standards development
  - Industry coordination

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Questions?

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Appendix: Residential Rebate Structure

Rebate per heating ton =
*Base Rebate + Efficiency Adder * (10*(Weighted Average COP – Min. COP))*

	Closed Loop		Open Loop	
	Water-to-Air	Water-to-Water	Water-to-Air	Water-to-Water
Minimum COP	3.6	3.1	4.1	3.5
Base Rebate (per 12,000 BTU/hr)	$1,500	$1,500	$1,500	$1,500
Efficiency Adder (per 0.1 COP above Minimum COP)	$100	$50	$100	$50
Maximum Rebate (per 12,000 BTU/hr)	$2,500	$2,000	$2,500	$2,000
Maximum Total Rebate (per system, based on 60,000 BTU/hr)	$12,500	$10,000	$12,500	$10,000

Appendix: Residential System Requirements

- Heat Pumps must be AHRI rated
- Designed to meet at least 98% of annual heating load
- System sized between 80% and 120% of peak load
- Vertically bored closed-loop projects must have a minimum of 150 feet per 12,000 BTU/hr of heating capacity
  - Horizontal and open loop systems will be subject to third party design review
- Closed-loop bore grouting must have a grout conductivity equal to or greater than anticipated earth conductivity of the drill site up to 1 BTU/hr-ft-°F.
- There must be at least 15 feet of separation between closed-loop bore holes.
- Open and horizontal loop projects will be required to submit the additional information listed below:
  - Open loop: method for determining pressure and flow rate
  - Horizontal loop: file from horizontal loop design software showing inputs and system design specs